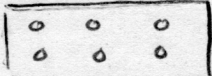


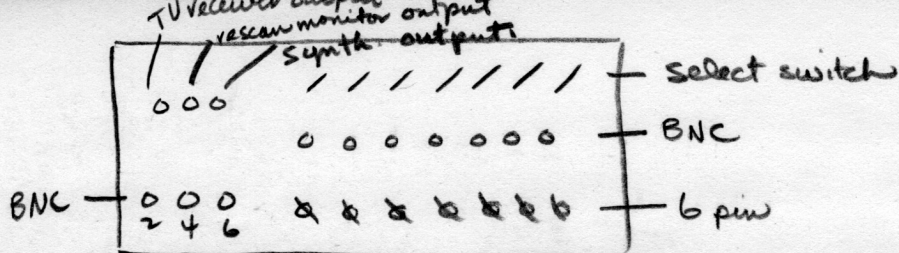
The Synthesizer will accept one to seven video or audio inputs. Video inputs should be in Sync with the total system, and the Synthesizer includes 6 pin connectors for Sony black and white cameras. Prerecorded material is rescanned from a monitor ( a rescan monitor is part of the system). For pattern generation audio signals may be input directly to the colorizer module; they may be free-running or in sync. The output from the Synthesizer is a color video image of broadcast quality.

The Synthesizer combines several modules including sync generator, input patch panel for cameras and oscillators, colorizer, video processing amplifier, ~~and~~ audio oscillators, audio amplifiers and the rescan monitor of "wobulator".

Sync Generator:  label

This module provides the timing pulses requires to synchronize the cameras. The vertical sync pulse occurs 60 times per second and is somewhat analogous to the sprocket holes on movie film. Every second pulse signals the beginning of a new video ~~frame~~ <sup>frame</sup> (30 frames per second). Each ~~frame signals the beginning of a~~ is formed by a succession of 525 horizontal lines; the beginning of each line occurs on the horizontal sync pulse. There are 15,750 of these pulses every second. Horizontal and vertical sync pulses appear on the sync generator outputs HD and VD and are combined on the Sync output. The sync generator also outputs a special blanking pulse which blanks out or blackens the video signal between lines and frames. This pulse appears on the Bl output. Color requires two synchronizing signals - a burst flag pulse occurring at the beginning of each line and the color subcarrier - a modulating signal of 3.58 megahertz. They appear on the BF and 3.58 outputs.

Input Patch Panel



This module provides one BNC video input and one 6 pin camera connector for each of the seven channels in the colorizer. The BNC connector routes any video signal or audio signal via the selector switch to the colorizer. The 6 pin connector carries the vertical and horizontal drive synchronizing pulses for the camera and the video signal from the camera. This video signal is input via the selector switch to the colorizer. The selector switch above each pair of connectors selects: in the UP position the BNC video input, in the DOWN position the 6 pin camera connectors. On the left side of this panel are 6 additional BNC connectors. The output of the rescan monitors TV receiver appears on the upper left connector. Note that this normal "off the air" TV signal is not in sync with the system. The upper middle connector is a video input to the rescan monitor and is often patched (with a BNC to BNC coaxial cable) to the upper right connector which is the output of the processing amplifier. The video inputs from the 6 pin connectors on channels 2, 4, and 6 are brought out on the lower connectors. This allows single camera to appear <sup>on</sup> on more than one colorizer channel. For example, if a camera is connected to channel 2 with a short BNC to BNC coaxial cable its video signal may be "bridged" from the lower left connector to the BNC input for channel 5. The input selector switch for channel 2 will be down, the switch for channel 5 up.

### Colorizer

This module is a seven channel video mixer plus colorizer. The input levels are continuously variable from zero to maximum strength and are controlled by seven gain pots on the colorizer panel. Pot refers to potentiometer similar to the volume controls on an audio amplifier. Each of the seven images is washed with a separate color. A typical distribution of colors would be: channel 1 red, channel 2 yellow, channel 3 green, channel 4 cyan, channel 5 blue, channel 6 magenta, channel 7 red. This distribution pattern may be shifted with the Hue pot so that the full range of colors is available to each channel. Note that the whole pattern is



shifted for all channels simultaneously. The following chart maps the distribution of color over the range of hue control. The amount or level of color is variable from black and white to full saturation with the Chroma pot.

	1	2	3	4	5	6	7
A	R	Y	G	Cy	B	Mg	R
B	Y	G	Cy	B	Mg	R	Y
C	G	Cy	B	Mg	R	Y	G
D	Cy	B	Mg	R	Y	G	Cy
E	B	Mg	R	Y	G	Cy	B
F	Mg	R	Y	G	Cy	B	Mg
A'	R	Y	G	Cy	B	Mg	R

Above the Gain pots on the colorizer are pairs of receptacles which allow the seven input signals (bottom receptacles) to be patched with a mini cable to any of the seven colorizer stages (upper receptacles). A single signal may be input to two or more colorizer stages with a Y patchcord. By selecting different combinations of colorizer stages and video level a variety of effects are possible including high contrast (almost a key), solorization etc. There are seven on/off switches above the receptacle pairs. These are three position switches: up-on, center - off, down-on but doesn't latch. The outputs from the colorizer stages are mixed and output to the video processing amplifier.

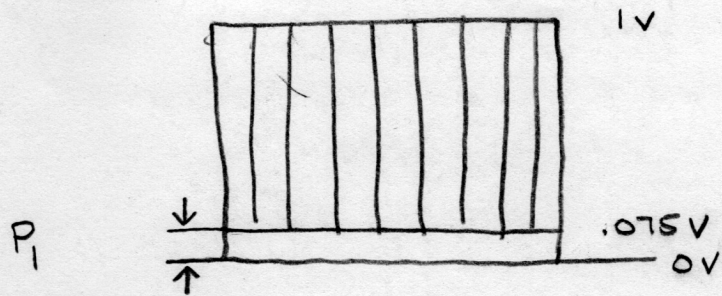
#### Video Processing Amplifier

The function of this module is to construct the composite color video output signal. Synchronizing pulses are added to the raw video ~~syn~~ signal. Color burst is added at the beginning of each line (used by the color receiver/monitor to decode the color signal.). The video signal runs on a scale of 100 units from 0 volts which is black to 1 volt which is white. Pedestal refers to the distance between the lowest point on the signal and 0 volts (usually pedestal is set to 7.5 units or .075 volts). However with the Pedestal control the video signal may be lifted up toward white. If the highest points on the signal now exceed one volt or 100 units these are clipped. If the signal is weak, only 50 units running from 0 to .5 volts, it may be expanded or amplified with the Contrast control to a full 100 units. At this point the video signal may be lifted up towards white by the Pedestal control/ The signal may be expanded by the Contrast control/ The output of the Proc Amp is available on the input patch panel as synthesizer out "Syn". A group of inputs and output from the patch panel,

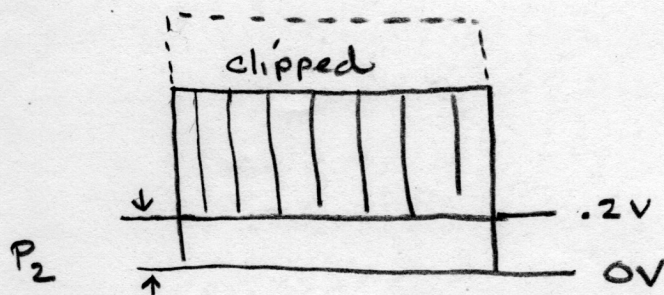
colorizer and proc amp are grouped on the rear of the colorizer rack. HD, VD Sync, BF and 3.58 are connected directly to the stnc generator. Next to there are two video outputs from the proc amp.



## Effects of Pedestal Control on Video Signal

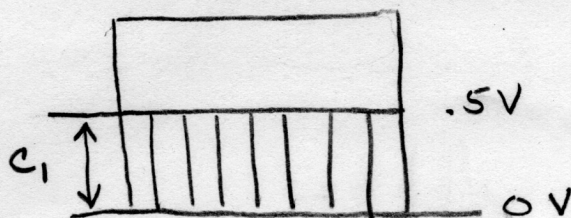


$P_1$  Normal Pedestal

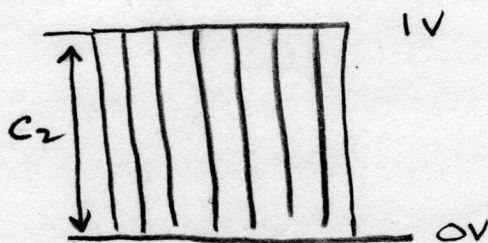


$P_2$  increased pedestal

## Effects of Contrast Control on Video Signal

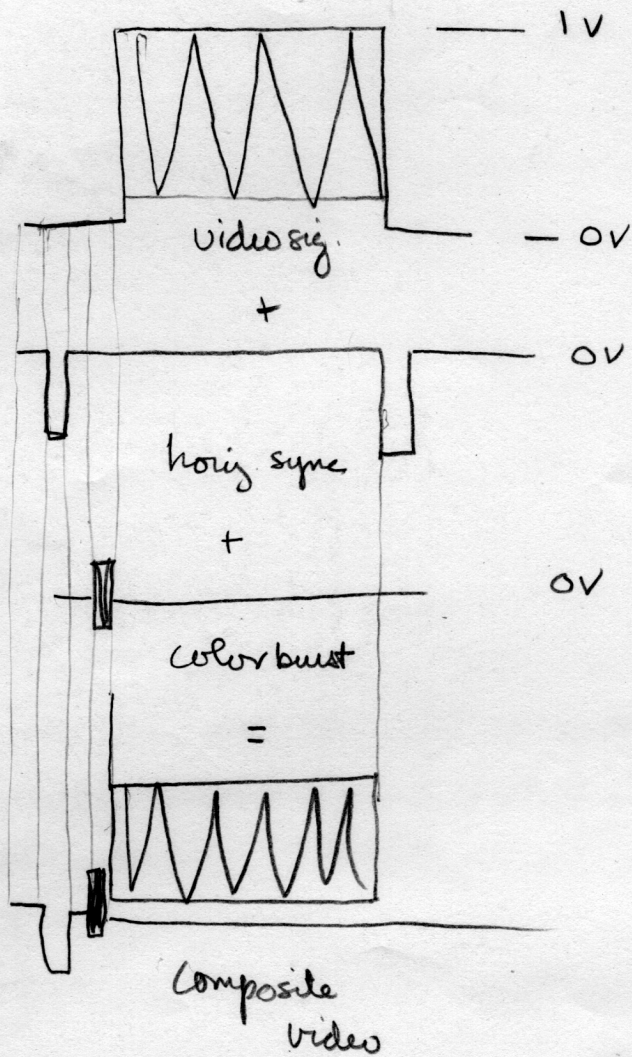


$C_1$  low contrast



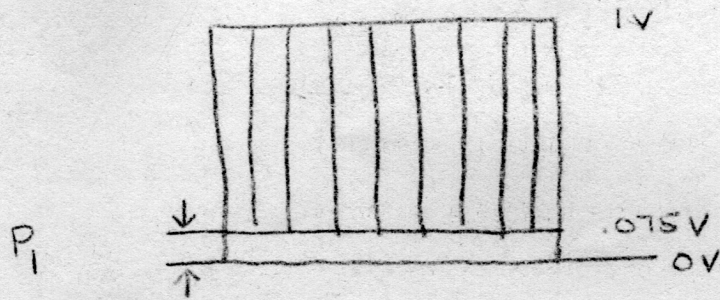
$C_2$  full contrast

# Composite Video Signal

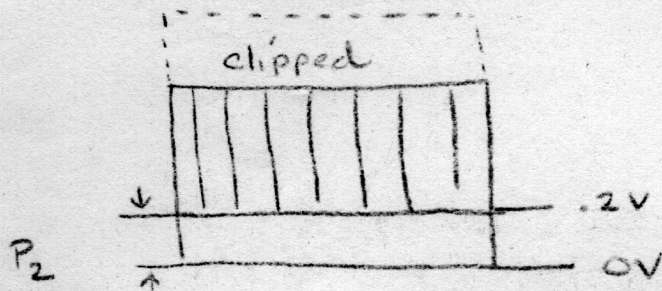




## Effects of Pedestal Control on Video Signals

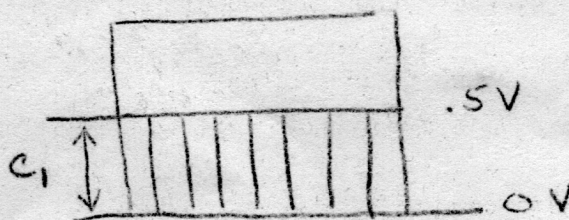


$P_1$  Normal Pedestal

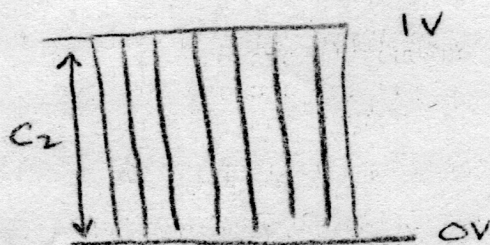


$P_2$  increased pedestal

## Effects of Contrast Control on Video Signal



$C_1$  low contrast



$C_2$  full contrast

## Audio Oscillators

An audio oscillator, signal generator or function generator traditionally was a test instrument used to align and service amplifiers and sound systems. It generates basic tones at any selectable frequency over the audio range (10-30,000 Hz). The synthesizer has three or more oscillator modules of various types. The simplest is the free running oscillator which generates a continuous waveform sine, triangle or square. A second type of oscillator is the syncable oscillator which generates a discontinuous waveform by ~~tuni~~ turning itself on and off in sync with an external pulse such as vertical sync or horizontal sync.

The oscillators may be connected directly to the BNC inputs on the colorizer in order to generate bar patterns. Horizontal bars are generated by frequencies which are multiples of 60 Hz. Frequencies that are multiples of 15,750 Hz generate vertical lines. The oscillator output normally runs up to  $\pm 10$  volts and is clipped when passed to the colorizer; thus the bar patterns usually appear a hard edged irrespective of the waveform selected. However with a low level sine wave output  $\pm 1$  volt a "soft-edged" bar results. The oscillators in combination are used to drive special yokes on rescan monitor which will distort or displace its image.



## DIAGRAMS

### DAudio Amplifiers

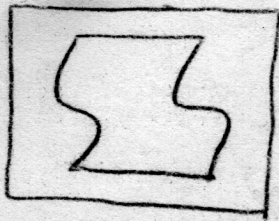
These audio amplifier modules are used to drive the special yokes on the rescan system monitors. It is possible to use the other audio inputs available on the amplifiers to drive the yokes with live or prerecorded music or audio signals. However most music involves waveforms so complex and varying that little results from a direct interface unless it is somehow reprocessed through filtering etc.



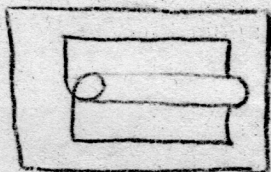
## Rescan Monitor or Wobbulator

This is a rather unique module of the Paik-Abe Synthesizer. It is a modified 9" Sony TV receiver. It functions as both receiver and monitor; the TV/Synth switch on colorizer selects either of these two modes. Using the Rescan BNC connector on the input patch panel a VTR, camera or output of the synthesizer may be input to the wobbulator in SYNth mode. A TV, VTR or camera image may be distorted using the special yokes and controls that are part of the wobbulator. If the output of the Synthesizer is used in addition to controlled distortion an optical feedback loop is set up. This is because the distorted image on the wobbulator is rescanned with a camera which is an input to the colorizer module. On the colorizer panel are switches and controls to alter the orientation and size of the wobbulator image. The  switch turns the image upside down by reversing the leads to vertical portion of the yoke. Similarly the  switch turns the image left to right (mirrored) by reversing the leads to the horizontal portion of the yoke. The vertical size control reduces the image to a horizontal line by attenuating the signal to the yoke. The horizontal size control (a Variac) reduces the image to a vertical line in the same way. Combined vertical and horizontal reduces the image to a point.

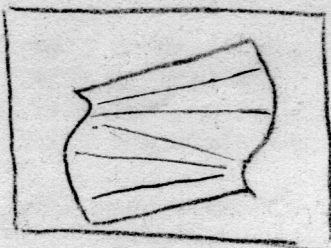
In addition to the normal yoke the wobbulator has two other yokes- a color receiver yoke and a continuous wind yoke. These are driven by the audio amplifiers and are used to displace or distort the image. The horizontal portion of the color yoke will pull the image side to side. The vertical portion of the yoke pulls the image top to bottom. In such a way the image appears to roll over itself as if on the surface of one or more horizontal drums or rollers. The continuous wind yoke produces an odd pattern which is best described by the accompanying illustrations. As with pattern generation these distortions correspond directly to the frequency and waveform of the oscillator input to the amplifiers. Some of these basic distortions are illustrated. Finally the Brightness and Contrast controls for the Wobbulator are brought out to the colorizer panel. The remaining vert, horiz, and tuner controls are on the original TV chassis which is mounted under the Wobbulator.



60 Hz sine wave on the horizontal portion of the color yoke.



60 Hz sine wave on the vertical portion of the color yoke



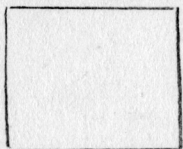
60 Hz sine wave on the continuous wind yoke



## Procedures for Setting Up the Synthesizer:

1. Check the cables interfacing the various modules  
Sync generator to colorizer (6) BNC to BNC cables connecting VD, HD, BI, BF, Sync and 3.58  
Oscillators to amplifiers - osc. #1 to the right channel aux input of amp #1,  
Osc. #2 to the left channel aux input of amp 31, ocs. 3 to the right channel  
aux input of amp 2  
  
Amplifiers to yokes - leads from the horiz portion of the color yoke to the  
4 ohm right speaker terminals of amp #1, leads from the vertical portion of  
the color yoke to the 4 ohm left speaker terminals of amp #1, leads from  
the continuous wind yoke to the 4 ohm right speaker output of amp # 2.
2. Input patch panel - connect the output of oscillator #3 to the BNC input of  
channel 6, set the channel 6 selector switch up, connect the rescan camera to  
the 6 pin input of channel 7, set the channel 7 selector switch down, connect  
SYNTH out to rescan in.
3. Colorizer panel - set the rescan module controls as follows: contrast and  
brightness 3/4 on, ↑ and ↔ to normal, mode selector switch to Synth
4. Power cords - plug auxillary power strip into power strip in synthesizer rack  
(sync generator, colorizer, oscillator 3 and auxillary power supplies should  
be already pulged into this strip), plug remaining oscillators and amps  
into the auxillary power strip.
5. Powering up the three(3) oscillators.

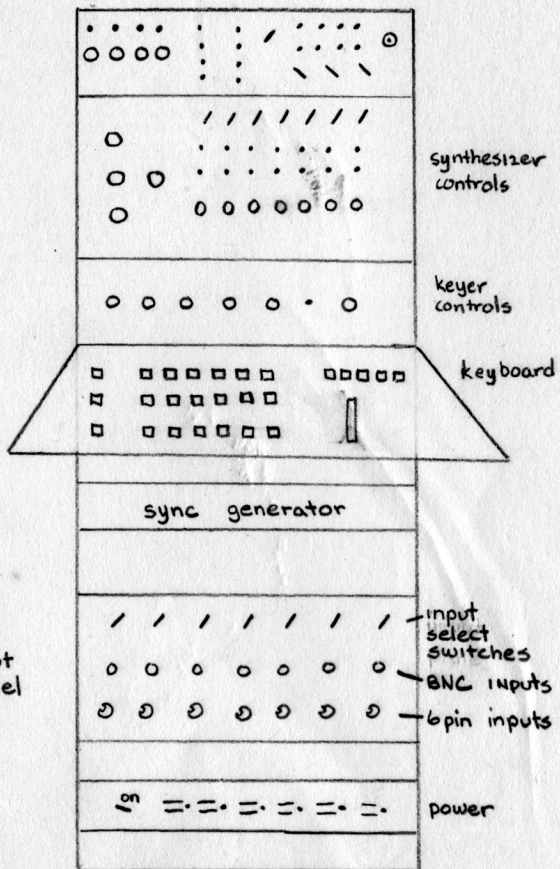
scan converter



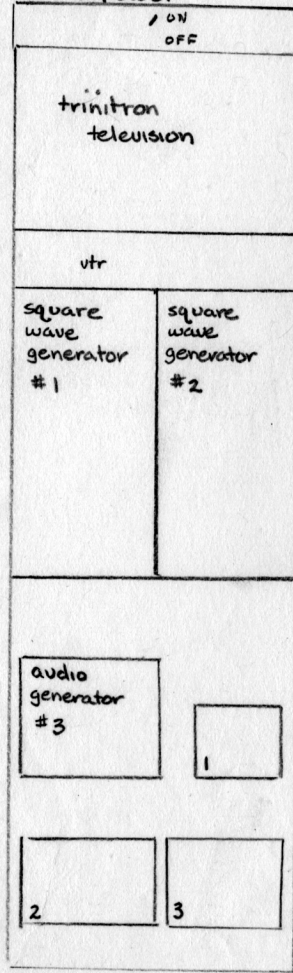
scan  
converter  
camera



input  
panel



main power



TUM

record player

audio patch panel

stereo amp

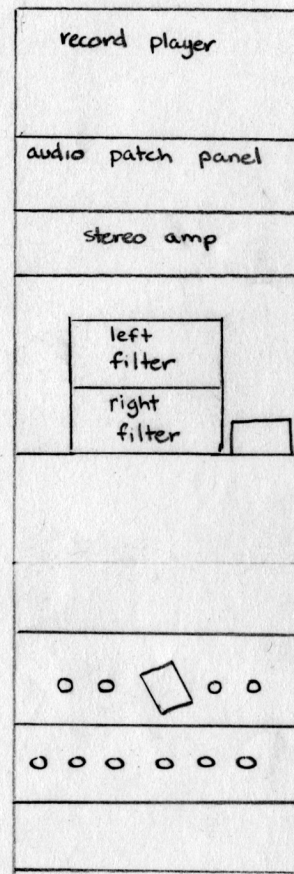
left  
filter

right  
filter

raster  
roll-over

talk-back  
system

raster  
roll-over  
controls





The first question asked of the video artist using the Synthesizer is, "Why?" Rather than get bogged down in a discussion of the purpose or meaning of art, a comparison of television to some other artistic mediums may answer this question. At its simplest the Synthesizer is like a big paintbrush and the color output monitor like a canvas. The various images and patterns input to the Synthesizer may be abstracted, mixed and colored under the control of the artist. However television involves the added dimension of time; like film it is a moving picture. So why not use film? Admittedly most of the effects available to the video artist (mixing, keying, solorization, colorizing) are also available to the filmmaker. The one effect exclusive to television is feedback. But the video artist has another important advantage - he works in real time. This immediacy is perhaps the most interesting and challenging aspect of video art. The video Synthesizer becomes an instrument and the artist an image musician. Like the electronic music synthesizer it is possible for the artist to be simultaneously player, conductor and composer.

Architecture has been called "frozen music". Experimental film continues to unthaw the music in visual images. The video synthesizer as an instrument completes this process of melting the frozen images of architecture and painting. Because of the similarity between the audio and video synthesizers a compositional system embracing both fields is inevitable. All together this makes television a most desirable medium for the artist.